STATE OF CALIFORNIA
CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL COAST REGION

STAFF REPORT FOR REGULAR MEETING OF May 30, 2002
Prepared on May 9, 2002

ITEM: **3**

SUBJECT: **Status Report on Duke Energy's Proposal to Modernize the Morro Bay Power Plant and Renew their NPDES permit. Request for Direction from the Regional Board.**

KEY INFORMATION:

Discharger:	Duke Energy North America, LLC
Location:	Morro Bay, San Luis Obispo County, CA
Discharge Type:	Industrial, Once-Through Cooling Water Flow
Current Design Flow:	707 million gallons per day (MGD); actual maximum is 668 MGD due to pump wear
Current Average Flow:	Annual averages vary greatly; 260 to 567 MGD
Proposed Design Flow:	475 MGD maximum proposed
Proposed Average Flow:	370 MGD annual average proposed
Disposal:	Estero Bay
Existing Order:	NPDES Permit Order No. 95-28

SUMMARY

This is a status report on Duke Energy's Morro Bay Power Plant modernization project, and includes background information for the newer Board members. Regional Board is scheduled to consider a draft National Pollutant Discharge Elimination System (NPDES) permit for the modernized facility at the September or November 2002 Regional Board meetings.

The schedule for the permit has been extended due to the complexity of the issues regarding the cooling water intake system. The Regional Board staff is coordinating with California Energy Commission staff and relies on their analysis of site-specific issues. For example, Regional Board staff asked the Energy Commission to do a site-specific feasibility analysis of cooling water alternatives. Staff will use the information provided in the site-specific analysis when developing the draft NPDES permit. The roles of the Energy Commission and the Regional Board are discussed later in this staff report.

Duke Energy requested a delay in the process following Energy Commission staff's draft recommendation (January 2002) that a closed cooling system be implemented for the modernized power plant. After holding a public workshop and considering Duke Energy's concerns regarding closed cooling, Energy Commission staff subsequently issued their Final Staff Assessment for this project on April 26, 2002. The Final Staff Assessment maintains the recommendation for a closed cooling system. The Energy Commission will hold evidentiary hearings on the Final Staff Assessment in Morro Bay from June 4th through June 7th.

After evidentiary hearings, the Commissioners will tentatively decide whether to accept, reject or modify the staff recommendation in

the FSA and issue a Presiding Members Proposed Decision (PMPD). The Commissioners will consider the Regional Board's draft NPDES permit when drafting the PMPD. The Commissioners will issue a final decision after the Board's hearing on the NPDES permit. The decision is expected in September (the date is not certain).

Regional Board staff agrees that closed cooling systems are feasible for this project based on the Final Staff Assessment. Staff also acknowledges that the Final Staff Assessment is a recommendation to the Energy Commission (as with this staff report, which includes a recommendation to the Regional Board). The estimated costs for closed cooling systems ($50 to $114 million depending on the source of the estimate) are high but not unreasonable to protect the State and National Estuary over the life of the project. Staff also believes that the habitat enhancement approach is a viable option in this case and may offer more ecological benefit in the long term for less cost. The basis of the habitat enhancement approach would be to increase the longevity and productivity of the Morro Bay Estuary by reducing sedimentation. If the Regional Board approves the habitat enhancement option, staff recommends establishing a funding source that is sufficient to pay for specific projects identified in this staff report (not necessarily all of the projects identified). Duke Energy could reduce the fund amount by implementing measures to reduce entrainment.

Duke Energy maintains that a closed cooling system is not feasible in Morro Bay, and has suggested that once-through cooling be permitted with a fund for habitat enhancement work to offset the cooling water withdrawal impacts. Duke Energy has indicated they would provide a minimum of $6 million for habitat enhancement in the Morro Bay watershed for this purpose. Duke Energy also maintains that the Energy Commission's Final Staff Assessment only concludes that a closed cooling system is conceptually feasible at Morro Bay.

Finally, staff requests direction from the Regional Board regarding the draft NPDES permit. The draft permit could require closed cooling, habitat enhancement, or a combination of these options. Assuming staff and Duke Energy can agree on the appropriate level of funding for habitat enhancement, staff believes the watershed and Estuary would realize a greater long-term benefit through habitat enhancement.

DISCUSSION

The Morro Bay Power Plant (Power Plant) has been in operation since the early 1950's. Duke Energy purchased the Power Plant from PG&E in 1998, and plans to modernize the facility to increase power production and efficiency. The modernized facility is scheduled to come on line in 2004, at a total capital cost of $650 million or more according to Duke Energy. Attachment 1 is a site map showing the Power Plant location, intake and outfall structures, and the general vicinity.

The existing facility consists of Units 1, 2, 3, and 4. Units 1 and 2 were constructed in the 1950's and produce 326 Megawatts (MW). Units 3 and 4 were constructed in the 1960's and produce 676 MW. Units 1, 2, 3, and 4 will be replaced with two state-of-the-art 600 MW combined cycle units. Upon completion of the project, the Power Plant will be capable of producing a total of 1,200 MW. Each new unit will consist of two gas-fired turbines and one steam turbine driven by the heat produced by the other two turbines. Each new unit will have two 145-foot tall stacks compared with the existing plant's three 450-foot tall stacks. The old units will operate while the new units are constructed. When the new units are ready to come on-line, the four old units will be taken out of service and removed along with most of the existing facility. Duke Energy plans to demolish the old power plant by 2007.

Table 1 compares the existing facility to the modernized facility. The cooling water flows have increased in recent years because the power plant has operated at a higher level in response to energy demands. Historical flow rates, when averaged over time, are similar to the predicted flow rates for the modernized plant. This is because the existing power plant operated at a low output level for several years

Table 1: Comparison of Existing and Modernized Power Plant Parameters. Duke Energy, 2001, 2002.

Parameter	Existing Power Plant	Modernized Power Plant
Number of Units	Four	Two
Net Power Output	1002 MW	1200 MW
Design Maximum Cooling Water Flow	707 MGD[1] 668 MGD[2]	475 MGD[3]
Average Annual Cooling Water Flow	260 to 567 MGD[4]	375 MGD[5]
Permitted Discharge Temperature Delta	30^0F	20^0F[6]
Average Discharge Temperature Delta	16.4^0F[7] 19.3^0F[8]	17.6^0F[9]
Discharge Location	Shoreline, North Morro Rock	To be determined
Intake Location	Morro Bay Harbor	To be determined
Intake Screen Approach Velocity	0.5 fps current limit due to pump wear	0.3 feet per second design

Note: Data is from Duke Energy, *Application for Certification* (AFC), October 2000, and the *Thermal Discharge Assessment Report* (TDAR), May 2001.
[1]Original design maximum. AFC p. 6.5-67.
[2]Current maximum is less than design due to pump wear. AFC page 6.5-9.
[3]Based on 20^0F delta T limit measured as intake versus discharge. More strict temperature limits would necessitate increased cooling water flow volume to maintain the same power output.
[4] Average flows varied over the past fifteen years depending on plant operation.
[5]Duke Energy's proposed annual average permit limit for the new units. May 2002.
[6]The proposed power units are designed for a delta T limit of 22^0 F
[7]Average monthly temperature differential for the year 2000. TDAR, p. 2-2
[8]Average temperature differential for the last six months of the year 2000. TDAR, p. 2-2
[9]Average temperature differential predicted by Duke Energy. TDAR P. 2-2.

prior to the recent energy shortage. Attachment 2 is a chart showing annual average water use since 1987. Duke Energy recently indicated they would accept permit limits of 475 MGD as a maximum flow, and 375 MGD as an annual average flow.

Review of Cooling Water Impacts

Thermal impacts occur along approximately 600 feet of rocky intertidal habitat on north Morro Rock. Other habitats do not appear to be affected, except in the immediate area of the discharge. The Board asked staff to consider the possibility of moving the discharge structure partway offshore, to the northwest end of Morro Rock. This option may reduce impacts on north Morro Rock, but would likely increase the thermal impacts along the west side of Morro Rock, and therefore would likely have no net benefit. Also, if the discharge point were moved, it would become a "new" discharge under the Thermal Plan. New discharges must be located offshore a sufficient distance such that the 4 degree F isotherm does not contact the shoreline. This means that if the discharge were moved, it would have to be moved a significant distance offshore, unless a variance were granted by the Regional Board. Duke Energy estimates that an offshore discharge structure would cost approximately $35 million (June 2001). Tetra Tech, the Regional Board's consultant on alternatives, estimates the cost of extending the discharge 3,500 feet offshore at about $23 million (December 2001). These estimates include the cost of laying new pipe onshore as well. The existing thermal impacts do not appear to warrant moving the discharge offshore.

Staff considers impingement impacts (organisms caught on the traveling screens in the intake structure) to be of relatively minor importance (based on the report required by Section 316b of the Clean Water Act). The amount of fish impinged is about 1.4 tons per year, and these are mostly northern anchovies (74% by number). About 850 pounds of invertebrates are also impinged annually.

Staff considers the entrainment impacts (smaller organisms drawn through the cooling system) caused by the Power Plant to be important. The entrainment study shows that

the power plant entrains hundreds of species, and that the proportional entrainment for some taxa is high. Proportional entrainment is the amount of larvae entrained relative to the amount produced in the source water body. The source water body of concern here is the Morro Bay Estuary. Duke Energy's 316b report calculates proportional larval losses based on the duration of larval exposure to entrainment (in days). Longer exposure to entrainment results in higher proportional loss rates. The 316b report lists larval losses for taxa that spawn in the estuary:

Unidentified Gobies:	11% to 43%
Shadow Gobies:	1% to 3%
Jacksmelt:	22% to 44%
Combtooth Blennies:	50% to 72%
Pacific Herring:	1% to 3%
Simple Average:	**17% to 33%**
Weighted Average:	**10% to 31%**

Note: The lower end of the range is based on the mean exposure time, and the upper end is based on maximum exposure time for each taxa.

The following proportional loss values are for coastal taxa:

Staghorn Sculpin:	5 %
Northern Lampfish:	2%
Rockfishes:	2%
White Croaker:	2%
Cabezon:	4%

Note: A proportional larval loss range is not applicable to coastal taxa because their calculated source water body varies depending on the size of larvae entrained. The loss rate is a constant.

The following proportional loss values are for invertebrates:

Brown Rock Crabs:	3%
Hairy Rock Crabs:	0.8%
Yellow Rock Crabs:	3%
Slender Crab:	0.08%
Red Rock Crab:	2%
Dungeness Crab:	5%

These taxa were the most abundant in the samples collected. The composition and abundance of taxa collected was determined by the sampling methodology. For example, a sampling net with a finer mesh would have collected many more taxa but would have clogged easily. The sampling methods chosen were based on feasibility. This subset of taxa therefore represents the hundreds of species entrained. The main purpose of the 316b study was to determine if the once-through cooling system entrains large proportions of larvae from the Estuary. The results clearly indicate that proportional larval loss is high for some species that spawn in the Estuary. The average loss range for taxa that spawn is the estuary is 17% to 33%, or 10% to 31% based on weighted averages (weighted for abundance of taxa in entrainment samples).

Duke Energy has stated that the best overall estimate of larval loss is 10% based on averaging all taxa together and using only the lower end of the range for taxa that spawn in the Estuary. Staff and the Regional Board's independent scientists disagree with this averaging method. Moreover, Dr. Raimondi, one of the Regional Board's independent scientists, believes that the best estimate of loss is the upper end of the range because the losses are based on risk and exposure. Dr. Raimondi states that a risk assessment should use maximum exposure values, not mean exposure values. For example, one should not use the mean age of people in the United States as an estimate of life expectancy.

Duke Energy's consultants recently recalculated entrainment losses for unidentified gobies using a method agreed to by the independent scientists. The purpose of this recalculation was to provide a single, best estimate of larval loss based on the size frequency distribution of larva collected. The recalculation could only be done for gobies (due the large sample size) and the result is a best estimate of 38% larval loss for this taxa. This value is closer to the upper end of the range previously provided for this taxa (11% to 43%). This recalculation indicates that the upper end of the loss ranges presented are valid and should be considered.

In addition, Duke Energy's approach combines estuarine spawners with coastal taxa and averages the values to arrive at a 10% overall loss. Staff and the Regional Board's independent scientists disagree with this averaging method. Coastal taxa have much larger source water bodies, up to hundreds of miles in length along the coast, and the proportional loss calculation for these taxa is different than for taxa that spawn in the estuary. The relevant question is: What proportion of larvae produced in the estuary are removed by the power plant? The answer is the data collected for taxa that spawn in the estuary, which shows high losses for some species. Staff averaged these values together, which results in a range of 17% to 33%, or 10% to 31% weighted for abundance. This represents the best estimate, based on the data, for all taxa that spawn in the estuary.

This range of larval loss for taxa that spawn in the estuary has been represented incorrectly in recent newspaper articles. Some articles have indicated that the power plant is killing up to one-third of Morro Bay. This is not correct. The power plant is capable of taking large proportions of larvae for some species that spawn in the estuary. While the result is an important impact on the ecological system, it should not be overstated. Hundreds of species are entrained, but many others that live in the estuary are not entrained. The species not entrained could be affected indirectly as part of the food chain.

Duke Energy also hired an additional scientist, Dr. James Cowan, Louisiana State University, to review the 316b report and previous Regional Board staff reports. Dr. Cowan's report concludes that the most defensible larval loss estimate is 10%, as stated by Duke Energy. Dr. Cowan also concludes that large losses of larvae have no impact on fish populations. Staff and the Regional Board's independent scientists disagree with Dr. Cowan's report. We disagree with the loss rate of 10% for the reasons noted above. Dr. Cowan's argument that large larval losses have no impact seems to be based on fisheries management models. The use of these models has resulted in the collapse of fisheries worldwide, including populations off the California coastline. Dr. Cowan's report, and fisheries models, do not consider the many other impacts acting on fish populations, such as sedimentation, loss of habitat, agricultural runoff, urban runoff, metals deposition, dredging, etc. These models have consistently failed because they do not reflect real world situations. In any case, the question is not whether the power plant will cause a species population to collapse; this question is fundamentally impossible to answer. The relevant question is: What proportion of larvae does the power plant take from the estuary? The answer is provided by the data collected in the 316b study, as discussed previously. This approach is most appropriate because it represents the ecological impact to the Estuary.

Dr. Cowan also suggests that some larvae may survive entrainment. Staff considers this argument to be speculation. As noted in Tetra Tech's independent report to the Regional Board, entrainment survival studies over the past thirty years have showed wide variability. One could emphasize the data that show high mortality, or emphasize the data that show low mortality. The larval entrainment mortality studies done at Diablo Canyon and Moss Landing Power Plants showed large variability, with some very high rates of mortality. Also, these estimates of mortality are likely to be understated because it is impossible to determine the actual long-term mortality in the field. The only valid approach is to consider 100% mortality of larvae that are entrained.

Dr. Cowan also seems to argue that larval mortality is naturally high, and that additional mortality due to the Power Plant is not important. Staff disagrees. The fact that larval mortality is naturally high makes additional mortality caused by the power plant more important, not less. For example, if only 1% of larvae survive to adulthood, an increased mortality rate of 30% reduces survival to 0.7%. This reduction could be very important, especially considering all the other impacts occurring on the Estuarine taxa. Dr. Cowan also states that a large percentage of larvae are discharged from Estuary with the outgoing tide and that the Power Plant simply

redirects a portion of this natural loss. Staff disagrees with this argument. Larvae move in and out of the Estuary with the tides in unknown ratios, and some larvae are transported to other estuarine areas. The larvae have a natural function in the ecosystem (regardless of what that function is), and the Power Plant is an impact on the natural function. For example, the exported larvae are extremely important to estuarine species because they constitute the genetic connection among populations from different areas, and genetic exchange is critical to species health. If a large fraction of larvae that were destined for export are instead entrained and killed, the likelihood of successful transport and immigration into another estuary decreases at least proportionally to the level of loss. The argument that few larvae would successfully make it to other estuarine areas makes the impact more important, not less. In any case, the fate of larvae under natural conditions is not relevant to the impact analysis. The Power Plant is not a natural part of the estuarine system, and the increased mortality caused by entrainment is not part of the natural process. Moreover, entrainment impacts are in addition to the other impacts acting on the Estuary. These types of arguments can be put in perspective by considering a discharge situation. Regional Board staff would not downplay discharge impacts based on natural losses inherent in biological cycles.

Accordingly, staff and the independent scientists consider the larval loss ranges discussed above to be the best estimate of the impact to the Estuary. This range is based on a cooling water flow rate of 427 MGD. If less water is used, the range of larval loss decreases proportionally, if more water is used, larval loss increases. Duke Energy recently proposed that the NPDES permit for the modernized permit include an annual average flow limit of 370 MGD, and a maximum flow limit of 475 MGD. The level of larval loss from the Estuary is important, especially considering that this impact is in addition to the many other factors acting to degrade the Estuary and the fact that Morro Bay has been designated a National and State Estuary deserving enhanced protection.

Regional Board Oversight

The Regional Board is authorized to issue an NPDES permit for the Power Plant. When issuing an NPDES permit the Board implements the requirements of the Porter-Cologne Water Quality Act and the federal Clean Water Act. The Regional Board's regulation of the Power Plant focuses on two major issues: the thermal discharge and the cooling water intake system.

With respect to the thermal discharge, the State Board's Thermal Plan requires that the NPDES permit contain limits or standards to assure protection of beneficial uses (marine habitat near the outfall). If the Regional Board finds that thermal impacts unreasonably affect marine habitat, more strict effluent limits could be included in the permit to reduce the adverse thermal impacts. However, regarding the Diablo Canyon Power Plant, the State Board ruled that the reasonable protection standard for thermal discharges allows some degradation of aquatic habitat (SWRCB Order WQ 83-1.). Also, the Thermal Plan permits the discharger to apply for a variance from thermal effluent limitations that are more stringent than necessary to maintain a balanced indigenous, community of shellfish, fish and wildlife in the receiving water. The variance procedure is governed by Clean Water Act section 316(a).

Clean Water Act section 316(b) requires that the location, design, construction, and capacity of the cooling water system reflect the best technology available for minimizing adverse environmental impacts to the Morro Bay Estuary.

During 1998, Regional Board staff established a multi-agency technical workgroup to oversee the biological studies related to the intake and outfall structures. Staff from the California Energy Commission, U.S. Department of Fish and Game, U.S. Fish and Wildlife Service, and Coastal Commission have participated in the technical workgroup process. Regional Board staff also invited observers to attend the technical workgroup meetings (as directed by the Regional Board). Observers have included representatives from the Morro Bay National Estuary Program, the Coastal Alliance on

Plant Expansion, the Environmental Defense Center, the Sierra Club, and the City of Morro Bay.

As part of the technical workgroup process, the Regional Board hired two independent scientists, Dr. Greg Cailliet, Moss Landing Marine Labs, and Dr. Peter Raimondi, UC Santa Cruz, to help ensure proper design and interpretation of studies related to the cooling water system. Regional Board staff also hired several additional independent experts as needed to address specific issues. The resulting biological studies are based on methods and approaches agreed to by Duke Energy and Duke Energy's consultants. The final biological reports referenced here were written and submitted by Duke Energy. The workgroup process compels members to work closely on every step of the environmental evaluation, including initial questions, study design, analyses of data, interpretation, and presentation. Independent scientific oversight also allows us to separate the scientific evaluation process from the value judgment process.

Ultimately, the Regional Board will determine which limitations are appropriate to require in the NPDES permit after considering staff recommendations and input from the public and Duke Energy.

California Energy Commission Oversight

The California Energy Commission oversees all non-nuclear power plant projects in the state in accordance with the Warren-Alquist Act in the California Public Resources Code. The Energy Commission Process works in parallel with the Regional Board NPDES permit process and the agency staffs work cooperatively.

The Energy Commission conducts a comprehensive environmental review of an entire project, including issues related to air, land, water, noise, culture, visual aesthetics, etc. The Energy Commission process pre-empts most state and local permits. It does not pre-empt the Regional Board's permit which, according to federal certification of our NPDES program, can only be issued by the State Board or a Regional Board. The final Energy Commission decision will mandate compliance with the NPDES permit and will include a finding that all state and federal laws and regulations will be complied with.

The Regional Board makes the determination of compliance with the Porter-Cologne Act and the Clean Water Act, including the Thermal Plan and section 316(b) when it issues the NPDES permit. The Energy Commission, makes a general determination of compliance with state and federal laws and in that context reviews the Thermal Plan and section 316(b) issues. Theoretically, it could find the project as regulated by NPDES permit does not comply with all state and federal laws and refuse to approve the project. However, the Energy Commission cannot modify or pre-empt the NPDES permit.

The Energy Commission is also the lead agency under CEQA, and the Warren-Alquist procedure is the certified functional equivalent of an Environmental Impact Report. As part of the California Environmental Quality Act (CEQA) process, the Commission must consider feasible alternatives to the project and mitigation measures for adverse environmental effects of the project, including potential adverse effects of the cooling water system. The Energy Commission can require changes to the cooling water system in order to mitigate significant environment effects under CEQA.

The Energy Commission's Warren-Alquist and CEQA process provides valuable information the Regional Board can use in adopting its NPDES permit and in implementing section 316(b). Also, because the Regional Board is a responsible agency under CEQA it must rely on the environmental document prepared by the Energy Commission. It is important to remember that the requirements of CEQA, the Warren-Alquist Act and section 316(b) are independent from each other.

The Energy Commission has also hired an independent consultant, Dr. Michael Foster, from Moss Landing Marine Labs, to help oversee the studies related to the cooling water system. The Energy Commission has also

hired Aspen Environmental, a consulting firm, to do the site-specific analysis of alternatives for the Morro Bay Power Plant. The site-specific analysis was requested by the Executive Officer following the Regional Board's July 12, 2001 workshop on this project, where the Regional Board asked for additional information on alternatives for dealing with cooling water impacts.

Energy Commission staff completed their Final Staff Assessment for this project on April 26, 2002. The Final Staff Assessment concludes that a closed cooling system is feasible at Morro Bay and recommends denial of Duke Energy's proposed once-through cooling water system. The Final Staff Assessment can be viewed at: http://www.energy.ca.gov/sitingcases/morrobay/documents/index.html

The Final Staff Assessment is the staff report used by the Energy Commission in its hearing and decision making process. The Commission holds evidentiary hearings after the FSA is issued and the Presiding Commissioner issues a Presiding Member's Proposed Decision (PMPD) after considering all the evidence in the record, in addition to the FSA. The PMPD should also consider the Draft NPDES permit. Also the California Coastal Commission submits to the Commission, a report regarding compliance of the project with the California Coastal Act. This report may address the impacts of the cooling water system. The report may not pre-empt or modify the NPDES permit, but it must be incorporated into the PMPD unless the Energy Commission finds its recommendations are infeasible or implementation of its recommendations would harm the environment.

Because the Energy Commission's final decision is the equivalent of an Environmental Impact Report, and the Regional Board must rely on it to make CEQA findings, the Regional Board cannot finally adopt an NPDES permit until the Commission adopts its final decision. But, the Commission must make a determination that the project, subject to the NPDES permit, complies with all state and federal laws. The solution to this problem may be for the Board to conduct a hearing on the Draft NPDES permit, probably in September or November, and to tentatively adopt the NPDES permit subject to review of the final CEQA document and adoption of CEQA findings. The CEC would then issue its final decision and certification and at the next Board meeting the Regional Board would finally adopt the NPDES permit and make CEQA findings.

Energy Commission Final Staff Assessment
The Final Staff Assessment includes a site-specific analysis of cooling alternatives that considers several issues such as visual impacts, noise, land use, local ordinances, and costs, as summarized briefly below:

Visual Impacts: The Final Staff Assessment acknowledges that a closed cooling system will be a large structure, but maintains that the new power plant with a closed cooling system is an improvement compared to the existing power plant, and that visual impacts can be mitigated to less than significant levels. Regional Board staff will provide photographic simulations in its presentation, which will compare the existing and proposed power plants, at this Regional Board meeting.

Noise Impacts: The Final Staff Assessment states that noise impacts from a closed cooling system can be mitigated to less than significant levels with proper design and equipment, and will be less than the existing power plant.

Land Use: The Final Staff Assessment states that the Morro Bay site will accommodate a closed cooling system. It should be noted that the Final Staff Assessment uses design criteria submitted by Duke Energy, which Duke Energy now considers incorrect. Duke Energy currently uses design criteria that results in a significantly larger closed cooling system, as discussed below. In addition, Duke Energy maintains that the smaller closed cooling system designed by Energy Commission staff and their consultants is also too large for the site. However, the Final Staff Assessment states that any land use impacts can be mitigated to insignificant levels.

Costs: Cost estimates are discussed later in this staff report.

As noted above, a main issue between Duke Energy and Energy Commission staff is the appropriate design parameters for a closed cooling water system. Energy Commission staff state that Duke Energy's operational criteria for their closed cooling system design is not appropriate because it is based on producing a full 1200 MW during weather conditions that would occur less than 1% of the time. The result is that Duke Energy's closed cooling system is twice the size of Energy Commission staff's system. Both designs are conceptual at this point. In any case, Regional Board staff is relying on the Final Staff Assessment conclusion that closed cooling systems are feasible at Morro Bay. Ultimately, the Energy Commission itself will decide which design is appropriate.

Another main issue is compliance with the Coastal Act and Morro Bay's Local Coastal Plan. If the Regional Board and the Energy Commission require closed cooling and the cooling water discharge is totally eliminated, the Power Plant project may not be "coastal dependent," and therefore may not comply with the City's Local Coastal Plan. Regional Board staff acknowledge the issue, but will rely on the Energy Commission, Coastal Commission, and City of Morro Bay for a resolution. It should be noted that if a closed cooling systems is implemented, there may still be other discharges (depending on the ultimate facility design) associated with the Power Plant that would utilize the existing discharge structure. Also, the existing switchyard and gas lines for the facility may have a role in determining if the facility is coastal dependent in this particular case.

In summary, the Final Staff Assessment concludes that a closed cooling water system should be implemented for the following reasons (these are Energy Commission staff opinions based on their site-specific analysis; the Energy Commission will consider their staff's recommendation and the recommendations of other parties in their final decision):

1. Closed cooling is feasible at this site. Noise, visual, and land use impacts associated with closed cooling can be mitigated to insignificant levels.

2. Once-through cooling will cause a significant impact on the Morro Bay Estuary.

3. Morro Bay is a National and State Estuary. These designations require agencies to implement the utmost protection of the resource. (It should be noted that Duke Energy is proposing to build the largest newly constructed power plant in California on one of the smallest National Estuaries in the United States, using the most ecologically damaging cooling option available).

4. Morro Bay is officially listed as an impaired water body under Section 303(d) of the Clean Water Act. Moreover, the U.S. U.S. EPA is especially concerned about entrainment impacts on impaired water bodies, as stated in the new 316(b) regulations for new facilities, and the proposed 316(b) regulations for existing facilities. It should be understood that entrainment impacts are in addition to the many other factors impacting this National and State Estuary, such as sedimentation, metals, pathogens, bacteria, agricultural runoff, urban runoff, and periodic dredging.

5. The U.S. U.S. EPA also makes it clear in the new and proposed 316(b) regulations that estuaries are among the most sensitive water bodies, and should be protected accordingly.

6. There is general agreement among local environmental professionals that the ecological health of the Morro Bay Estuary has declined over the past several decades (Mike Multari, Director, NEP).

7. The state of California has lost over 90% of its wetlands and estuaries in the past one-hundred years. The resources of the remaining wetlands and estuaries should

be protected to the highest degree possible.

8. A once-through cooling water system would continue to impact the estuary for up to fifty years.

Further, the Energy Commission's Final Staff Assessment states that the habitat enhancement option is not appropriate at this site for the following reasons:

1. Habitat enhancement does not directly eliminate or reduce the adverse impacts caused by once-through cooling. Once-through cooling causes ecological damage/losses to an estuarine system that is already degrading over time. It is preferable to avoid impacts rather than attempt to mitigate them after the fact;

2. The new U.S. U.S. EPA regulations on cooling water intakes, and the special status of the Morro Bay Estuary, reinforce the need to eliminate the adverse impacts of once-through cooling;

3. The acquisition of suitable habitat adjoining Morro Bay and in the supporting watershed may be challenging;

4. The restoration of in-situ (in-kind habitat) in Morro Bay may be challenging;

5. The long-term nature of the impacts associated with the Applicant's proposed once-through cooling will result in continuing and increasing (because the estuary is in decline) impacts for decades;

6. The uncertainty and difficulty of determining if mitigation is ultimately effective and complete many years after licensing; and

7. The extensive annual monitoring of the health/improved productivity of the bay/estuary that would be needed for the life of the project with the possibility of modifying/increasing the mitigation to be more effective as needed.

Regional Board staff appreciate the concerns listed above, but believe that the habitat enhancement approach is a viable alternative in this case, and may provide a greater benefit for the Estuary in the long-term, as discussed later in this staff report.

Interpreting Clean Water Act 316(b)

Clean Water Act section 316(b) states:

> "Any standard established pursuant to section 1311 of this title or section 1316 of this title and applicable to a point source shall require that the location, design, construction, and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impact."

Section 1311 of the Clean Water Act prohibits all discharges from point sources except subject to a permit, it also mandates dischargers to comply with technology based effluent limits and effluent limitations for toxic pollutants developed by U.S. EPA and requires implementation of more stringent state standards. Section 1316 provides for compliance with U.S. EPA promulgated effluent limitations for new sources. Generally, this provision of section 316(b) has been interpreted to mean that when an NPDES permit is issued for a facility that discharges from a point source to surface water and also uses a cooling water intake, the permit writer must impose the best technology available (BTA) in the permit.

Until recently there were no U. S. EPA regulations interpreting section 316(b). In November of 2001, U.S. EPA issued final regulations for applying 316(b) to new power plants. In February 2002, U.S. EPA issued proposed regulations for applying 316(b) to existing power plants. U.S. EPA will not issue final regulations for existing plants for about a year. According to the regulations, the modernized MBPP is not considered a "new" plant because it will be using the existing intake structure and the design (maximum) volume of intake water will not increase. Since the existing plant regulations are still in draft, there are no EPA regulations directly applicable to MBPP. In the absence of applicable regulations, U.S. EPA directs

permit writers to continue using a case-by-case analysis when applying 316(b). U.S. EPA also notes that its 1977 Draft 316(b) Guidance is advisory only.

In the absence of applicable legal direction from the U.S. EPA, the final regulations for new plants and the commentary accompanying them in the federal register provide the best guidance available on what is a reasonable interpretation of section 316(b). There are also a number of court opinions and U.S.EPA administrative opinions to guide the permitting process. It should be remembered that U.S. EPA intends to more stringently regulate new plants as compared to existing plants because the cost and feasibility of closed cycle cooling is lower for a new plant than an existing one. Therefore, if an existing plant complies with the requirements for new plants, it will clearly comply with any requirement expected in the future regulations for existing plants.

U.S. EPA comments on the new regulations show that a comparison of available technologies is an appropriate approach under 316(b). Industry comments on the new regulations argued that a 316(b) analysis must begin with a biological study to determine if the intake system causes population or ecosystem effects before requiring application of any technology. U.S. EPA responded that the language of 316(b) does not compel this interpretation. Instead, when interpreting 316(b) to establish nationwide standards for new plants, U.S. EPA considered what technologies were available and established standards for minimizing a suite of adverse environmental impacts (entrainment, impingement, etc.). These standards reflect technologies for new facilities that are available and economically practicable, and that do not have unacceptable non-aquatic environmental impacts.

U.S. EPA found the best technology available for new facilities is closed-cycle wet cooling, and so established national performance standards based on closed-cycle wet cooling. U.S. EPA emphasized that this might not be the best technology available at existing power plants for the purpose of a nationwide standard. U.S. EPA rejected dry cooling as best technology available for a nationwide standard but acknowledged that it might be the best technology available for a specific case (such as where there is a lack of water for mechanical draft cooling towers).

U.S. EPA's comments also addressed the idea of restoration (habitat enhancement) as a substitute for technology based changes to the intake system. The final regulations allow a discharger to propose alternative technologies that will achieve the U.S. EPA performance standards based on close-cycled wet cooling. U.S. EPA acknowledged that acceptable technologies could include aquatic filter barriers if the required performance standard was demonstrated. U.S. EPA also noted that restoration projects (habitat enhancement) could be acceptable. If a quantitative demonstration of the effectiveness of restoration is not feasible, U.S. EPA would accept a qualitative demonstration that fish and shellfish in the water body will be maintained at a substantially similar level to that which would be achieved with protections based on closed-cycle wet cooling.

While U.S. EPA stresses that their analytical approach was used for nationwide standards and applied only to new facilities, their analysis assists in the decision faced by this Regional Board. In this case, staff is gathering information about various technologies and when the information gathering is complete, will make a recommendation about the best technology available for the Morro Bay Power Plant at a cost that is not wholly disproportionate. Draft NPDES permit provisions regarding the cooling water intake will reflect the performance of the best technology available. Also, interpretation of adverse environmental effects will not be limited to population effects, but will consider overall ecological impacts, cumulative impacts, and the condition of the environment in which the entrainment and impingement are occurring.

The background information provided by the U.S. EPA for the final regulations and the draft existing regulations states that certain areas are of special concern, such as estuaries and water bodies that are already impaired.

Morro Bay is a National and State Estuary, and is also on the Clean Water Act Section 303(d) list of impaired water bodies based on sedimentation, metals, and pathogens. Staff agrees with the U.S. EPA that additional impacts due to entrainment are of special concern in this case.

The draft regulations are less strict than the final regulations for new power plants. However, it should be noted that U.S. EPA refers to the draft regulations as the "minimum" standards that must be applied.

The draft regulation proposes a "best technology available" performance standard that requires facilities located on estuaries to reduce impingement mortality by 80% to 95% and reduce entrainment by 60% to 90%. The baseline for this reduction is a shoreline once-through cooling system with no impingement mortality or entrainment controls. For the modernized power plant, the baseline is Duke Energy's proposed once-through cooling water design flow of 475 MGD. To meet the proposed U.S. EPA performance standard, Duke Energy would have to reduce this cooling water flow by 60% to 90%, and may have to implement impingement mortality controls as well. However, the draft regulations do not make these reductions mandatory. Instead, three options are offered as follows:

1. A facility may demonstrate that the existing design and/or habitat restoration measures already meet the national performance standard.

2. A facility may select technologies and/or habitat restoration measures that meet the national performance standard.

3. Facilities may demonstrate that the cost of compliance is greater than the cost estimates considered by U.S. EPA in developing the national performance standard, or that the cost of compliance is greater than the benefit of meeting the national standard. If the facilities costs of compliance are greater than U.S. EPA's cost estimates or site-specific benefits, the facility qualifies for a site-specific determination of best technology available.

U.S. EPA finds that technologies for meeting the proposed standard are available and economically practical for existing facilities. It should be noted that U.S. EPA's approach with these draft regulations is based on retrofitting an existing facility. This is not the case with the modernized Morro Bay Power Plant, where the project consists of tearing down the old plant and building a new one. The Power Plant could be built with a closed cooling water system without retrofitting costs. Retrofitting costs would only apply if the existing intake structure were modified to include modern travelling screens or other devices.

Also, regarding costs, the U.S. EPA's current approach is to determine if the costs of alternative cooling options are "wholly disproportionate" to the benefit to be gained. The draft regulations for existing facilities weaken this standard. The draft regulations propose that alternatives need not be implemented if the cost of the alternatives is simply greater than the U.S. EPA costs estimates used to develop the national performance standard, or if the costs are greater than the benefit to be gained. This approach will be highly controversial because agencies and utilities will strongly debate the "value" of resource impacts. While economic value can be calculated for a few commercially harvested species (and is often included in 316b reports), true ecological value is difficult to express in dollar value, and ecological protection of resources is a main goal. Regional Board staff are concerned that the proposed regulations, if adopted, could result in no action being taken to address entrainment and impingement impacts at existing facilities, even when a new power plant is being built.

Staff believes that a better approach is to require minimization of entrainment and impingement or implementation of a habitat enhancement program that provides a greater ecological benefit than could be achieved with minimization of entrainment and impingement, or a combination of options. If

a greater ecological benefit can be shown, and there are specific actions that can be taken to achieve the greater benefits, habitat enhancement should be considered as a viable option. This approach is more protective of the affected resource. The habitat enhancement approach must be evaluated on a case by case basis and depends entirely on the condition of the affected ecosystem, whether there are specific actions that could improve the ecological system, and the amount of improvement to be gained. The implementing agency can evaluate the benefits of reducing cooling water impacts to the benefits of other actions by using common units. This approach is applied to Morro Bay later in this staff report.

Alternatives for Addressing Adverse Impacts

Alternatives evaluations are usually based on options and technology that are known to work, such as cooling towers and dry cooling systems. Other systems can be considered, such as the aquatic filter and fine mesh screens, but they must be shown to work. If the Regional Board were to require an alternative cooling water system, the most defensible requirement would be based on the type of systems that are in place or being implemented at other power plants. Most of the new power plants in California are using or plan to use cooling towers or dry cooling systems, thus these systems are available and have been proven at other sites in California and nationwide.

The site-specific evaluation conducted by Energy Commission staff in their Final Staff Assessment concludes that closed cooling is feasible at the Morro Bay site. Duke Energy disagrees with this conclusion. Regional Board staff believe that while issues regarding visual impacts, noise and land use are debatable, a closed cooling system is feasible at Morro Bay. We note that there are several options available, such as salt water based mechanical draft cooling towers with plume abatement equipment, dry cooling, or hybrid systems. Or, as the Energy Commission's Final Staff Assessment states, closed cooling could be used to handle the majority of the cooling load, and a once-through cooling system could be used to handle the remaining load when needed. Although Energy Commission staff did not consider salt water mechanical draft cooling towers in their report, Tetra Tech, the Regional Board's consultant on alternatives, states that salt water systems are available and in use throughout the United States. Tetra Tech provides several examples of operating systems, and provides cost estimates for construction and operation. Tetra Tech notes that the main issue with salt water cooling towers is the need for corrosion resistant materials and the probable need for plume abatement equipment to control salt particle drift near the power plant. Plume abatement can be expensive, up to 100% of the capital costs. These costs are presented next in this report.

Costs of Alternatives

Table 2 presents cost estimates for cooling water alternatives. Duke Energy's initial cost estimates (June 2001) for dry cooling and hybrid cooling were significantly higher than their current estimates (January 2002). Duke Energy's June 2001 cost estimates included high efficiency losses caused by closed cooling systems, and the cost of constructing additional power plants elsewhere to make up for the efficiency loss. Duke Energy's revised estimates eliminate those costs, so the overall estimate is now lower. However, Duke Energy also changed its operation design criteria such that the closed cooling systems are now larger and more expensive. Duke Energy's current design criteria calls for a cooling system that would allow production of 1200 MW of power, 24 hours a day, at an ambient temperature of 85 degrees F. This forces the cooling system to be larger and more expensive. Duke Energy's revised estimates also include costs that are not included in the CEC staff and Tetra Tech estimates, such as $15 to $25 million for "site preparation" prior to construction of the cooling systems. The total cost estimates from Duke Energy and the independent groups are therefore quite different, however, in most cases the capital cost estimates from all three parties are similar.

TABLE 2: Cost Estimate Comparisons for Alternatives. Amortized values are calculated with a discount rate of 7% over thirty years. NOTE: Amortized values could be calculated over a fifty year period, which would lower the annual cost value and may better reflect actual longevity of the Power Plant.

Alternative	Total Present Value Duke, June 2001	Revised Total Present Value Duke, Jan 2002	Total Present Value Tetra Tech, Dec 2001	Total Present Value CEC Staff, April 2002
Offshore Intake	$40 to 45 million	Not Done	$23 million*	Not Done
Salt Water Mechanical Draft Cooling Towers	$165 million or amortized at $13 million per year for 30 years	Not Done	$24.7 to $26.4 million or amortized at $2.1 to $2.3 million per year for 30 years**	Not Done
Dry Cooling	$300 million or amortized at $24 million per year for 30 years	$106 to $111 million or Amortized at $9 million per year for 30 years	$50 to $58 million or amortized at $4.3 to $5 million per year for 30 years	$50 million. Present Value not provided, but capital costs are similar to Tetra Tech estimates
Hybrid Wet/Dry Systems	$273 million or amortized at $22 million per year for 30 years	$109 to $114 million or Amortized at $9 million per year for 30 years	$59 to $64 million or amortized at $5.1 to $5.5 million per year for 30 years	$35.6 million Present Value not provided, but capital costs are similar to Tetra Tech estimates

*Tetra Tech and CEC staff did not estimate the cost of an offshore intake structure. However, Tetra Tech provided an estimate for an offshore discharge structure ($23 million). Staff believes the costs for an offshore intake structure would be similar to an offshore discharge structure.

** Tetra Tech does not include costs for plume abatement equipment in this estimate for salt water cooling towers. The cost of for this added technology could double the total cost to approximately $50 million. Tetra Tech is currently refining this estimate for the Regional Board.

Staff considers Duke Energy's estimated amortized cost of about $9 million per year over 30 years to be relatively low compared to the potential annual gross revenue of the Power Plant, which could be in the range of hundreds of millions of dollars per year. Also, the amortized costs would be lower if a fifty-year period were used.

If the Regional Board approves a once-through cooling water system for the modernized Power Plant, there are few options available for reducing entrainment and impingement. These options include the aquatic filter and fine mesh screens, both of which should be considered experimental. Variable speed pumps could also be required to minimize flow to some degree.

Habitat Enhancement

Another option is habitat enhancement. Accelerated sedimentation is a major problem in Morro Bay, resulting in rapid filling of the bay and loss of estuarine habitat. Morro Bay is listed on the 303(d) list of impaired water bodies because of sedimentation (and pathogens and metals). Morro Bay has lost more than 25% of its tidal volume in the past century due to accelerated erosion from upland areas; the greatest loss has been in the south bay and delta areas, where Estuary volumes have decreased 43% and 66% respectively. Under natural conditions, the Estuary would

fill in gradually over thousands of years. Under current rates of accelerated erosion and sedimentation, the Estuary may fill in and become a meadow in 300 years or less (Haltiner, 1991). This continuing loss of habitat is a major threat to the Morro Bay Estuary and was one of the driving forces behind the State and National Estuary designations.

Sedimentation occurs mainly during storms, so there are large seasonal and annual variations in sediment discharges into Morro Bay from Chorro and Los Osos Creeks. A single 100-year stream flow event could contribute about 700,000 tons of sediment to the Bay. In contrast, a single two-year stream flow event is expected to contribute about 1,300 tons of sediment to the Estuary. If these episodic and highly variable events are averaged over time, the average annual sediment loads range from 45,500 to 67,770 tons per year (USDA, SCS, 1989a.). Over the past century, sedimentation has caused an approximately 200-acre increase in salt marsh in the upper Estuary, with a subsequent decrease in intertidal mud flats. In addition, it appears that the intertidal mudflats throughout the Estuary have been raised by about two feet due to sedimentation (Haltiner, 1991).

The habitat enhancement concept can be evaluated at Morro Bay by comparing three things: 1) the "effective habitat productivity loss" range caused by the Power Plant, 2) the loss of habitat caused by current sedimentation rates, and 3) the increase in habitat and habitat productivity that would result from decreasing current sedimentation rates.

This staff report discusses that the Power Plant "takes" about 17% to 33%, or 10% to 31% based on weighted averages, of the larvae from species that spawn in the estuary (higher for some taxa, and lower for others). Using this range, one can convert the larval loss to "equivalent" habitat acres. This is the amount of estuarine habitat it would take to produce the loss caused by the Power Plant. The estuarine system at Morro Bay is approximately 2300 acres in size. Hence, it would take up to 0.33 x 2300 acres = 759 acres (rounded off to 760 acres) of additional and comparable estuarine habitat to compensate for the loss caused by the Power Plant. Note that there is no actual physical loss of habitat; instead this estimate represents the habitat required to compensate for production forgone from existing estuarine habitat (defined here as effective larval productivity loss). The effective larval productivity loss over the life of the Power Plant is simply the product of the duration of the impact and the effective loss. For example, if the Power Plant at Morro Bay operates for 50 years, then the best estimate of the long-term effective loss is 760 acres x 50 years = 38,000 acre-years. If we account for the fact that the Estuary is filling in, the effective loss over the life of the Power Plant is about 34,750 acre-years. Next, we can consider how to compensate for this loss.

It is not possible to "create" 760 acres of "new" estuarine habitat in Morro Bay. Salt marsh habitat has increased and estuarine habitat has decreased over the past 120 years due to accelerated sedimentation, so it may be possible to convert the salt marsh back to estuarine habitat through major dredging efforts. However, removing one habitat type for the sake of another habitat type is highly controversial. Moreover, dredging the back bay before addressing upstream erosion problems is not practical because the dredged areas would simply fill in again in a short period of time. Therefore, the concept of increasing estuarine habitat longevity is considered.

Phillip Williams and Associates, a consulting firm with expertise in estuarine systems, wrote a report in 1988 regarding sedimentation in Morro Bay and concluded that the Estuary will fill in due to accelerated upstream erosion within 300 years. This is based on net accumulation of sediment as estimated from cross sections taken within the Estuary over the last 120 years. Attachment 3 illustrates this decline in habitat over time. Obviously, the decline is not a straight line; actual erosion and sedimentation rates vary greatly from year to year depending on rainfall and other factors. However, over the long-term the linear trend is a reasonable way to model the loss of habitat. It follows that the area of habitat available

over the next 300 years is the area under the line on the graph, which is 2000 acres over 300 years. The general solution is to integrate the equation for the loss of habitat. However, an estimate can be achieved by recognizing that the area under the line represents the area of available habitat over time. This area is (300 years x 2000 acres)/2 = 300,000 acre-years. (Note that we don't lose all 2,300 acres because the Army Corps will keep a channel open for navigation. Staff assumes 300 acres is maintained).

If sedimentation is decreased by some amount, we decrease the loss of habitat and its associated productivity (resulting in a net gain of productivity compared to the do-nothing approach). A linear relationship is assumed, so that reducing sedimentation by 50% means increasing the longevity of the Estuary by 50%. For example, reducing sedimentation rates by 50% results in a longevity of 300 years + 50% = 450 years. Under this scenario the area under the new line is (2000 acres x 450 years)/2 = 450,000 acre-years, which is a gain of 50%, or 150,000 acre-years. This is a conservative estimate because we assumed a linear relationship. It is likely that a 50% decrease in sedimentation rates will cause a greater than 50% increase in habitat longevity.

It is now possible to compare the benefits of the habitat approach with a closed cooling system, as follows:

Closed Cooling System:

Cost:	$50 million to $114 million
Benefit:	38,000 acre-years of productivity (immediate benefit)

Habitat Approach:

Cost:	Up to $30 million
Benefit:	150,000+ acre-years of productivity (future benefit)

In this case, the habitat approach provides a greater ecological productivity benefit over the long-term. This comparison establishes the nexus between Power Plant impacts and the benefits of habitat enhancement. The nexus here is the comparison of benefits in like units (acre-years). Staff is currently working to define costs on a "per acre-year" basis so that we can evaluate an appropriate dollar amount for the habitat enhancement fund.

Also, the habitat benefit noted above is the smallest possible benefit that would be realized. The true benefits of decreasing sedimentation almost certainly will be larger than the gain of 150,000 acre-years because the relationship is not linear as we assumed here, and the overall benefit will include these qualitative elements as well:

1. Reducing the periodic smothering of habitat whenever it rains. The estuary currently goes through the cycle of being smothered and having to recover each winter, which reduces productivity.
2. Reduced input of pesticides, fertilizers, metals, and other pollutants, which clearly degrade production in any water body.
3. Reduction of sedimentation will benefit all estuarine organisms, including those not directly affected by entrainment (e.g., vegetation, birds, etc).

A drawback of this approach is that the benefit of increased estuarine longevity will not occur until some time in the future. To better quantify sedimentation rates, estuarine longevity, and the point at which the benefits of increased estuarine longevity begins, Regional Board staff hired Phillip Williams and Associates (PWA). PWA has well known expertise in estuarine hydrodynamics and sedimentation issues, and is familiar with the Morro Bay setting (having written one of the main reports on sedimentation for this watershed). PWA's report should be submitted to the Regional Board in June 2002. Staff will use the report to provide better estimates of sedimentation rates and better quantify the benefits of sedimentation reduction.

Duke Energy also hired an additional consultant to help quantify the habitat enhancement approach, and will be submitting additional information from their analysis to the Regional Board in the near future.

Actions to Reduce Sedimentation

In response to the sedimentation problem, the Morro Bay National Estuary Program office has been working with the community and many agencies and nonprofit groups to educate property owners, help implement better land management practices, and acquire and restore flood plains that capture sediment. The following projects, with estimated costs, are currently underway.

Projects Underway to Reduce Sedimentation:

Hollister Ranch Acquisition and Restoration, Chorro Creek

- 580 Acres Purchased @ $5 million (done)
- 80-120 Acres to be Restored @ $1.2-$1.8 million ($15K/acre)

Walters Creek confluence on Chorro Creek (Cal Poly Property)

- No purchase necessary, land swap between Cal Poly and Fish and Game
- 20-30 Acres to be Restored @ $250 to $450 thousand ($12K-$15K/acre)

Lower Los Osos Creek Cropland

- 30-60 Acres to be Purchased @ $350-$900 thousand ($12-$15K/acre)
- 30-60 Acres to be Restored @ $350K-$900 thousand ($12K-$15K/acre)

Sub Total Estimated Costs: About $3.1 million

Potential Projects to Reduce Sedimentation, Contingent Upon Willing Property Owners:

Chorro Creek between Chorro Flats & Hollister Peak Ranch

- Approximately 300 acres to be purchased @ $3.5-4.5 million
- 90-110 acres to be restored @ $1.4-1.7 million

Warden Lake, Warden Creek (numerous property owners would be involved)

- 50-75 acres to be purchased @ $500-$900 thousand
- Approximately 20-30 acres to be restored @ $200-$450 thousand

Sub Total Estimated Costs: About $6.58 million

Total Short-Term Land Acquisition and Restoration Costs: About $9.7 million

In addition, best management practices to reduce erosion on uplands can be implemented relatively quickly. The National Estuary Program's Conservation Plan estimates it will cost approximately $13.5 million to implement best management practices on ranch land in the watershed. This cost for BMPs includes incentive programs, demonstration projects, oversight, and other costs that would not easily be covered by landowners. The total cost for these short-term action items is therefore estimated to be about $9.7 million + $13.5 million = $23.2 million.

It should be noted that the Morro Bay National Estuary Program Conservation Plan also estimates total long-term acquisition and restoration costs at about $20 million. This includes the $9.7 million mentioned above. The total long-term land acquisition and restoration costs ($20 million) plus the estimated cost of BMPs ($13.5 million) is $33.5 million.

If the Regional Board approves the habitat enhancement approach, staff recommends establishing a fund to help pay for the short-term action items noted above (this list will likely be revised as we continue to explore possibilities). A substantial fund is necessary to ensure success and to account for any uncertainties involved in the approach. Regional Board staff continues to work with Duke Energy on refining erosion/sedimentation action items to more closely correlate entrainment impacts with habitat enhancement efforts. Also, the Phillip William report, due in June, will help staff clarify sedimentation rates and estuarine longevity benefits due to reduced sedimentation. It is more important to establish appropriate projects and their scope, with a strong nexus based on like units (acre-years), and then determine the costs, rather

than just establishing a dollar amount. We will also further evaluate the benefit of specific action items in terms of acre-years. This will allow us to determine an appropriate dollar amount for a habitat enhancement fund.

Regional Board staff are preparing a Total Maximum Daily Load (TMDL) for sedimentation/siltation for the Morro Bay Watershed and Estuary. The current draft TMDL document describes the watershed, Chorro and Los Osos Creeks, the Estuary, the erosion and sedimentation problem, and prescribes numeric sediment load targets that will reduce sedimentation in the estuary. The TMDL also includes an implementation plan that describes the types of projects needed to reduce sedimentation by 50%. The Regional Board will consider staff's TMDL report at this Board meeting.

The Morro Bay National Estuary Program office is also organizing a major effort toward habitat enhancement, restoration, and preservation within the Estuary. This effort is being undertaken with the Army Corps of Engineers and the County of San Luis Obispo. This is a major ecosystem scale effort that includes identifying potentially feasible habitat restoration and enhancement options, public review and comment, extensive environmental review, and congressional approval and budgeting, all over a seven to eight year schedule. If successful, local funds will have to be provided as a match for any federal funds awarded by Congress. This project may result in habitat restoration work in the Estuary, such as dredging to increase estuarine volume. The cost for this type of work in Morro Bay is unknown, but will likely be in the millions to tens of millions of dollars. This work, if approved and funded, would not be done for several years pursuant to the current schedule. These costs are not included in the estimates above.

Staff believes that the Morro Bay National Estuary Program efforts to purchase and restore flood plains and the Regional Board's TMDL work have the potential to significantly reduce sedimentation, provide permanent habitat preservation, protection, and enhancement, and ultimately increase the longevity and productivity of the estuary if adequate funds are available. It makes sense to reduce erosion and minimize sedimentation before any potential dredging project, as mentioned above. As such, the habitat enhancement approach may be a viable option for dealing with the impacts caused by Duke Energy's Morro Bay Power Plant.

As described earlier in this report, the U.S. EPA recognizes the habitat enhancement approach as an alternative that can be used to comply with the best technology available requirement of Section 316b of the Clean Water Act. U.S. EPA will accept habitat enhancement for new power plants based on a qualitative analysis "if consideration of impacts other than impingement mortality and entrainment is included, the … technologies will maintain fish and shellfish in the water body at a substantially similar level to that which would be achieved" if technology based on closed-cycle wet cooling were applied (40 CFR section 125.86.) While these regulations do not apply to existing power plants, including the Morro Bay Power Plant, they indicate U.S. EPA's determination that habitat restoration can be used to comply with 316(b), even if a quantitative comparison of habitat restoration and closed-cycle cooling is not possible. The proposed regulations for existing facilities also allow the habitat enhancement approach.

Other agency representatives, such as California Department of Fish and Game and Coastal Commission staff, have previously expressed their concern that in-situ habitat remediation is the most preferred type of "mitigation" work (dredging of sediment, replanting eel grass, etc.). We believe that doing only in-situ habitat restoration work would result in failure over time because it would not address the sedimentation problem. A broad ecosystem level approach must be undertaken to fully realize the cause of the problem, implement solutions that address the cause, and provide long term restoration for the Morro Bay Estuary. An ecosystem approach would include multiple efforts to reduce erosion throughout the watershed, and in-situ habitat restoration work. This is the

approach being taken by the Regional Board and the Morro Bay National Estuary Program.

Duke Energy submitted a letter on April 24, 2002, which refers to their preferred habitat enhancement approach and expresses a desire to work with Regional Board staff on such a program. Although we have not seen a detailed report, there are general areas of agreement. We agree that effective power plant losses in acre-years can be compared to sedimentation reduction benefits in the same units, as discussed in this staff report.

RESPONSE TO COMMENTS

A Regional Board member asked staff to respond to the following questions (paraphrased by staff):

Question: For each of the larval species identified in the entrainment study, please describe where the species spawns (in the bay, in the estuary, along the near coastal waters, etc), how the species spawns (lays eggs or broadcasts its spawn, etc.), where the larvae grow up, where the juveniles spend time, and where the adults are found (e.g., bays, estuaries, near coastal waters, or further off shore).

Staff Response: The 316b report describes this information for the most abundant species found in the entrainment study. Staff has forwarded a copy of the relevant 316b report section for Board member review rather than repeating the lengthy descriptions here. It is important to realize that the most abundant taxa found in the entrainment study are only a small subset of the hundreds of species of fish, invertebrates, and algae that are actually entrained by the power plant. The species entrained encompass all types of taxa with all types of life histories and habitats (fish, invertebrates, algae). For the vast majority of species, little or no life history information is known (such as life stages, spawning, movements, etc.). Entrainment of many species constitutes an overall ecological impact (not a species-specific impact). If only a few species were entrained, mitigation might consist of hatcheries to replace the entrained taxa. In fact, Duke Energy proposed this type of mitigation early in our process. Staff rejected the idea because it is not appropriate to mitigate the impact to a few species when hundreds are impacted. Our approach is to improve the overall ecological system in direct response to the impact on the ecological system.

Question: When was the most recent survey done regarding the distribution and population status of the entrained species.

Response: There have been no distribution and population surveys for the abundantly entrained taxa. The complete lack of comprehensive baseline studies in Morro Bay makes it impossible to determine cause and effect with respect to the many factors impacting the Estuary. This is why staff and the independent scientists agreed that the best approach (and the only short-term approach) for evaluating Power Plant impacts was to estimate the proportional loss of larvae caused by the Power Plant.

Question: Please describe how each of the entrained species will benefit from the proposed mitigation plan for Morro Bay. Specifically does the proposed mitigation plan increase the breeding ground for the entrained species?

Response: By extending the life of the Estuary, all of the species that spawn in the Estuary benefit over time. In the approach described in this staff report, the larval productivity loss caused by the power plant (in acre-years) is compared to the larval productivity gained by increasing estuarine habitat productivity (also in acre-years). As noted above, entrainment does not effect just a few species, and mitigation should not be based on a few species. In this case, all entrained species would benefit because the existence of the ecosystem on which they depend would be protected and extended over time. The habitat enhancement approach will not increase the breeding ground for entrained species. The main quantifiable benefit is increased habitat longevity. As mentioned in this staff report, there are other qualitative and more immediate benefits such as better water quality.

Coastal Alliance on Power Plant Expansion (CAPE), February 2, 2002: CAPE states that any habitat enhancement plan must be proven to offset the huge larval loss over the fifty-year life of the power plant with an equal or greater increase in larval productivity throughout the estuary. To Cape's knowledge, little or no data exist to validate the success of habitat enhancement programs as an offset to entrainment impacts.

Staff Response: We agree that the habitat approach must be shown to work. If the Regional Board approves this approach, staff will propose an independent panel of scientists to monitor the effectiveness of the program. We also agree that this approach is unique because it is based on increasing the longevity of the Estuary as a way to mitigate larval productivity losses. However, the approach should not be dismissed because it is unique. We know that sedimentation is causing the Estuary to fill in rapidly, and we know that we can reduce sedimentation. The Chorro Flats acquisition and restoration project is a highly successful sediment control effort. Best management practices that are known to reduce erosion (see the TMDL item in this Agenda) could be implemented relatively quickly in the watershed. These efforts will not immediately increase larval productivity in the Estuary, but will result in a major long-term benefit as described in this staff report.

Richard F. Smith, May 10, 2002: Dr. Smith submitted two letters for Regional Board review. These letters are included as Attachment 4 to this staff report. Staff did not have time to review the letters and comment for this staff here, but will provide a response in the future.

U.S. Fish and Wildlife Service, March 27, 2002: U.S Fish and Wildlife Service staff believe that a closed cooling water system is feasible for this project based on the Energy Commission's Final Staff Assessment, and recommends that Duke Energy implement closed cooling. If the Energy Commission determines that closed cooling is not feasible, Duke Energy should mitigate the impacts, and all relevant agencies should participate in the habitat enhancement plan process to ensure adequate mitigation. Finally, if once-through cooling is approved, Duke Energy should be required to conduct a long-term (10-year minimum) comprehensive monitoring program to fully evaluate the effects of entrainment and impingement.

Staff Response: If the Regional Board approves a once-through cooling system and the habitat approach, or a combination of closed cooling and the habitat approach, staff will meet with all interested agencies via the technical workgroup to develop the best possible habitat enhancement program, including comprehensive monitoring. As mentioned in the response to CAPE, one approach is to have an independent panel assist with effectiveness evaluation.

Morro Bay City Council, Resolution No. 20-02: The Morro Bay City Council adopted Resolution No. 20-02, which states the City's position against closed cooling for the Morro Bay Power Plant due to visual, noise, land use, and other associated impacts.

Staff Response: See below.

Senator Jack O'Connell, March 20, 2002: Senator Jack O'Connell sent a latter dated March 20, 2002 to the California Energy Commission. The letter states Senator O'Connell's support for the City of Morro Bay's Resolution against closed cooling alternatives. The letter states that the proposed closed cooling alternatives are not feasible, are incompatible with the unique community of Morro Bay, would violate numerous ordinances and regulations, and would cause adverse impacts.

Staff Response: See below.

Assembly Member Abel Maldonado, March 20, 2002: Assembly Member Abel Maldonado sent a letter dated March 20, 2002 to the California Energy Commission. The letter states Assembly Member Maldonado's support for the City of Morro Bay's Resolution against closed cooling systems. The letter states that a closed cooling system would cause or exacerbate visual, noise, land

use, air, and socio-economic impacts compared to the proposed project.

Staff Response: The Final Staff Assessment addresses each of the issues raised by the Resolution and letters above. Regional Board staff realizes that many of these issues are controversial, however, we are relying on the site-specific analysis and conclusions in the Final Staff Assessment at this time.

CONCLUSION

This report summarizes the current status of the Morro Bay Power Plant modernization project. The Energy Commission's Final Staff Assessment is complete and recommends that a closed cooling system be required to protect the Morro Bay Estuary. The estimated costs for closed cooling systems are high but not unreasonable. Staff also believes that the habitat enhancement approach is a viable option in this case and may offer more ecological benefit in the long term for less cost. If habitat enhancement is used, staff recommends establishing a fund based on the cost of short-term action items such as those listed in this staff report. Staff is continuing to evaluate the specific benefits of action items (in terms of acre-years of productivity), associated costs, and margins of safety to account for uncertainties, to determine an appropriate dollar amount for the habitat enhancement fund. The range of costs for habitat enhancement is significantly less than the cost range for dry cooling or hybrid cooling systems Duke Energy has agreed to fund a habitat enhancement approach for at least $6 million.

RECOMMENDATION

Staff requests that the Regional Board provide direction regarding the cooling water alternatives. Assuming staff and Duke Energy can agree on the appropriate level of funding for habitat enhancement, staff believes the watershed and Estuary would realize a greater long-term benefit through habitat enhancement. While most of us concerned with this issue would agree that impact prevention is preferred over mitigation, this recommendation is based on the cost benefit analysis in this report, where the "benefit' is to the Estuary. If the Regional Board is not interested in pursuing the habitat enhancement approach for the modernized Power Plant, staff recommends proceeding with a draft permit for the existing Power Plant, which would recommend the habitat enhancement approach. Duke Energy has indicated that they would not pursue modernization of the Power Plant if closed cooling were required, therefore, a draft permit requiring closed cooling may not be necessary.

ATTACHMENTS

1. Morro Bay Power Plant site map.
2. Morro Bay Power Plant annual water use since 1987.
3. Power Plant larval productivity loss versus productivity gain due to sedimentation reduction.
4. Letters from Richard Smith.